CLAIMS

1. A process for fabricating a heat sink, comprising:

providing a heat sink; and

treating the heat sink to a cryogenic quenching process.

2. The process of Claim 1 wherein the heat sink is fabricated from a metal alloy having precipitating constituents.

3. The process of Claim 1 wherein the heat sink is part of a microelectronic package including a die affixed to a carrier substrate.

4. The process of Claim 1 further comprising prior to treating the heat sink to the cryogenic quenching process first treating the heat sink to a temperature high enough to lead to a secondary re-crystallization grain growth, which changes the microstructure of the heat sink from a fine grain to a coarse grain.

5. The process of Claim 1 wherein the treating of the heat sink to the cryogenic quenching process includes gradually lowering the heat sink to a cryogenic temperature and then immediately raising the temperature of the heat sink.

6. The process of Claim 4 wherein the changing of the microstructure of the heat sink from a fine grain to a coarse grain improves the thermal conductivity of the heat sink

by reducing the number of grain boundaries in the heat sink that obstruct the movement of atomic and molecular species.

7. The process of Claim 1 further comprising affixing the heat sink to a microelectronic die mounted to a package substrate.

8. A process of fabricating a heat sink, comprising:

providing a heat sink comprised of a metal alloy;

raising the temperature of the heat sink to cause a secondary re-crystallization grain growth in the metal alloy; and

treating the heat sink to a cryogenic quenching process.

9. The process of Claim 8 wherein the metal alloy has precipitating constituents.

10. The process of Claim 8 wherein the thermal conductivity of the heat sink is improved by changing the microstructure of the metal alloy from a fine grain structure to a coarse grain structure.

11. The process of Claim 8 wherein the heat sink is fabricated from an aluminum alloy.

12. The process of Claim 8 wherein the heat sink is fabricated from a copper alloy.

13. The process of Claim 8 further comprising affixing the heat sink to a microelectronic die mounted to a package substrate.

14. A process of fabricating a heat sink, comprising:

providing a heat sink; and

expanding the grain structure in the heat sink from a fine grain to a coarse grain to enhance the thermal conductivity of the heat sink.

15. The process of Claim 14 wherein the heat sink is fabricated from a metal alloy with secondary re-crystallization grain growth.

16. The process of Claim 15 further comprising treating the heat sink to a cryogenic quenching process by gradually lowering the heat sink to a cryogenic temperature and then immediately raising the temperature.

17. The process of Claim 14 wherein the heat sink is part of a microelectronic package which includes a die affixed to a package substrate, the thermal conductivity of the heat sink improved by reducing the grain boundaries that obstruct the movement of atomic and molecular species.